Intrinsic Defects in Wide Bandgap Semiconductors: Study by Magnetic Resonance Techniques I

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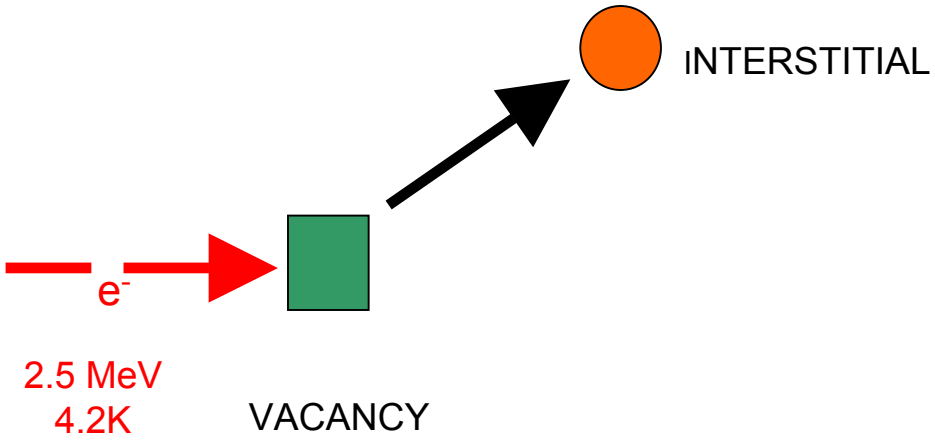
- **Zinc Oxide.** Essential to the successful fabrication of electronic and optical devices from this promising material, is the understanding of its *intrinsic defects* (lattice vacancies and interstitial atoms), which control many of the vital processing steps. Nothing was known concerning the interstitials prior to this work.

- **Production of the defects.** Atoms are displaced into interstitial positions by high energy electron irradiation, leaving lattice vacancies behind. The irradiation is performed at a very low temperature (4.2 K) to freeze the defects in place prior to study.

- The participation of three postdoctoral visitors has been involved in this ongoing study.



Intrinsic Defects in Wide Bandgap Semiconductors: Study by Magnetic Resonance Techniques II

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- The defects are revealed in the photo-luminescence (PL) after electron irradiation, and changes are observed at subsequent annealing stages.
- New electron paramagnetic resonance (EPR) spectra, as yet not identified, are detected in the PL.
- Vacancies on the two sublattices are known to be stable from previous studies. Therefore, this first time observation of the low temperature annealing stages already supplies the important information that

  Interstitials are mobile in the lattice at these cryogenic temperatures!
- This surprising result may have serious consequences for the stability of devices made from ZnO.